CLAIMS

1. A reagent comprising:

a cytokine or chemokine-derived peptide or a cytokine-receptor-derived peptide or chemokine-receptor derived-peptide;

a carrier protein; and

an adjuvant.

2. The reagent according to claim 1 wherein the cytokine or chemokine is selected from the group consisting of IL-4, IL-13, IL-5, IL-9, IL-25, eotaxin or TARC 3.

3. The reagent according to claim 1 wherein the cytokine is IL-4 and the peptide is selected from the group consisting of: 6 or more consecutive residues of DITLQEIIKTLNSLT (SEQ ID No. 1, amino acids 4-18 of IL-4); 6 or more consecutive residues of EKETFCRAATVLRQFYSHH (SEQ ID No. 2, amino acids 41-59 of IL-4); 6 or more consecutive residues of QQFHRHKQLIRFLKRLDRNLWGLA (SEQ ID No. 3, amino acids 71-94 of IL-4); 6 or more consecutive residues of TLENFLERLKTIMREKYS (SEQ ID No. 4, amino acids 108-125 of IL-4); 6 or more consecutive residues of EQKTLCTELTVTDIFA (SEQ ID No. 5, amino acids 19-34 of IL-4); and 6 or more consecutive residues of AGLNSCPVKE (SEQ ID No. 6, amino acids 94-103 of IL-4).

4. The reagent according to claim 1 wherein the cytokine is IL-13 and the peptide is selected from the group consisting of 6 or more consecutive residues of VPPSTALRELIEELVNITQ (SEQ ID No. 7, amino acids 4-22 of IL-13); 6 or more consecutive residues of MYCAALESLI (SEQ ID No. 8, amino acids 43-52 of IL-13); 6 or more consecutive residues of VAQFVKDLLLHLKK (SEQ ID No. 9, amino acids 92-105 of IL-13); 6 or more consecutive residues of KDLLLHLKKLFREGRFN (SEQ ID No. 10, amino acids 97-113 of IL-13); 6 or more consecutive residues of KIEVAQFVKDLLLHLKKLFREGRFN (SEQ ID No. 11, amino acids 89-113 of IL-13); 6 or more consecutive residues of SAIEKTQRMLSGFC (SEQ ID No. 12, amino acids 58-71 of IL-13); and 6 or more consecutive residues of NVSGCSAIEKTQRMLSGFC (SEQ ID No. 13, amino acids 53-71 of IL-13).

5. The reagent according to claim 1 wherein the cytokine is IL-9 and the

peptide is selected from the group consisting of 6 or more consecutive residues of PTLAGILDINF (SEQ ID No. 14, amino acids 4-11 of IL-9); 6 or more consecutive residues of TRYPLIFSRVKKSVE (SEQ ID No. 15, amino acids 65-79 of IL-9); 6 or more consecutive residues of NALTFLKSLLEI (SEQ ID No. 16, amino acids 102-113 of IL-9); 6 or more consecutive residues of PASKCHCSANVTSCLCLG (SEQ ID No. 17, amino acids 23-40 of IL-9); 6 or more consecutive residues of CTRPCFSE (SEQ ID No. 18, amino acids 46-53 of IL-9); and 6 or more consecutive residues of KNNKCPYFSCEQPCN (SEQ ID No. 19, amino acids 82-96 of IL-9).

6. The reagent according to claim 1 wherein the cytokine is IL-5 and the peptide is selected from the group consisting of 6 or more consecutive residues of PTSALVKETLALLSTHRTLLIA (SEQ ID No. 20, amino acids 6-27 of IL-5); 6 or more consecutive residues of PTSALVKETLALLST (SEQ ID No. 21, amino acids 6-20 of IL-5); 6 or more consecutive residues of HRTLLIA (SEQ ID No. 22, amino acids 21-27 of IL-5); 6 or more consecutive residues of EERRRVNQFLD (SEQ ID No. 23, amino acids 88-98 of IL-5); 6 or more consecutive residues of TVERLFKNLSLIKK (SEQ ID No. 24, amino acids 64-77 of IL-5); and PVHKNH (SEQ ID No. 25, amino acids 36-41 of IL-5).

7. The reagent according to claim 1 wherein the cytokine receptor is IL-4 α receptor and the peptide is selected from the group consisting of 6 or more consecutive residues of LYQLVFLLSEAH (SEQ ID No. 26, amino acids 36-47 of IL-4 α receptor); 6 or more consecutive residues of LLMDDVVSAD (SEQ ID No. 27, amino acids 63-72 of IL-4 α receptor); 6 or more consecutive residues of PPDNYLYNH (SEQ ID No. 28, amino acids 123-131 of IL-4 α receptor); and 6 or more consecutive residues of WAQAYNTT (SEQ ID No. 29, amino acids 177-186 of IL-4 α receptor).

8. The reagent according to claim 1 wherein the adjuvant is selected from the group consisting of: CpG oligodeoxynucleotides, alum, novasomes and liposomes.

9. The reagent according to claim 1 wherein the carrier protein is a highly immunogenic carrier protein.

10. The reagent according to claim 9 wherein the carrier protein is

selected from the group consisting of hepatitis B core antigen and hepatitis B surface antigen.

11. The reagent according to claim 10 wherein the peptide is fused into an immunodominant region of the carrier protein.

12. A method of inducing an immune response in an individual, comprising:

administering to an individual in need of such a treatment, an effective amount of a composition comprising:

a cytokine-derived peptide or chemokine-derived peptide or a cytokine-receptor derived petide or chemokine-receptor derived-peptide;

a carrier protein; and

an adjuvant.

13. The method according to claim 12 wherein the cytokine is selected from the group consisting of IL-4, IL-13, IL-5, IL-9 or IL-25.

14. The method according to claim 12 wherein the cytokine is IL-4 and the peptide is selected from the group consisting of: 6 or more consecutive residues of DITLQEIIKTLNSLT (SEQ ID No. 1, amino acids 4-18 of IL-4); 6 or more consecutive residues of EKETFCRAATVLRQFYSHH (SEQ ID No. 2, amino acids 41-59 of IL-4); 6 or more consecutive residues of QQFHRHKQLIRFLKRLDRNLWGLA (SEQ ID No. 3, amino acids 71-94 of IL-4); 6 or more consecutive residues of TLENFLERLKTIMREKYS (SEQ ID No. 4, amino acids 108-125 of IL-4); 6 or more consecutive residues of EQKTLCTELTVTDIFA (SEQ ID No. 5, amino acids 19-34 of IL-4); and 6 or more consecutive residues of AGLNSCPVKE (SEQ ID No. 6, amino acids 94-103 of IL-4).

15. The method according to claim 12 wherein the cytokine is IL-13 and the peptide is selected from the group consisting of 6 or more consecutive residues of VPPSTALRELIEELVNITQ (SEQ ID No. 7, amino acids 4-22 of IL-13); 6 or more consecutive residues of MYCAALESLI (SEQ ID No. 8, amino acids 43-52 of IL-13); 6 or more consecutive residues of VAQFVKDLLLHLKK (SEQ ID No. 9, amino acids 92-105 of IL-13); 6 or more consecutive residues of KDLLLHLKKLFREGRFN (SEQ ID No. 10, amino acids 97-113 of IL-13); 6 or more consecutive residues of KIEVAQFVKDLLLHLKKLFREGRFN (SEQ ID No. 11, amino acids 89-113 of IL-13); 6 or more consecutive residues of

SAIEKTQRMLSGFC (SEQ ID No. 12, amino acids 58-71 of IL-13); and 6 or more consecutive residues of NVSGCSAIEKTQRMLSGFC (SEQ ID No. 13, amino acids 53-71 of IL-13).

16. The method according to claim 12 wherein the cytokine is IL-9 and the peptide is selected from the group consisting of 6 or more consecutive residues of PTLAGILDINF (SEQ ID No. 14, amino acids 4-11 of IL-9); 6 or more consecutive residues of TRYPLIFSRVKKSVE (SEQ ID No. 15, amino acids 65-79 of IL-9); 6 or more consecutive residues of NALTFLKSLLEI (SEQ ID No. 16, amino acids 102-113 of IL-9); 6 or more consecutive residues of PASKCHCSANVTSCLCLG (SEQ ID No. 17, amino acids 23-40 of IL-9); 6 or more consecutive residues of CTRPCFSE (SEQ ID No. 18, amino acids 46-53 of IL-9); and 6 or more consecutive residues of KNNKCPYFSCEQPCN (SEQ ID No. 19, amino acids 82-96 of IL-9).

17. The method according to claim 12 wherein the cytokine is IL-5 and the peptide is selected from the group consisting of 6 or more consecutive residues of PTSALVKETLALLSTHRTLLIA (SEQ ID No. 20, amino acids 6-27 of IL-5); 6 or more consecutive residues of PTSALVKETLALLST (SEQ ID No. 21, amino acids 6-20 of IL-5); 6 or more consecutive residues of HRTLLIA (SEQ ID No. 22, amino acids 21-27 of IL-5); 6 or more consecutive residues of EERRRVNQFLD (SEQ ID No. 23, amino acids 88-98 of IL-5); 6 or more consecutive residues of TVERLFKNLSLIKK (SEQ ID No. 24, amino acids 64-77 of IL-5); and PVHKNH (SEQ ID No. 25, amino acids 36-41 of IL-5).

18. The method according to claim 12 wherein the cytokine receptor is IL-4 α receptor and the peptide is selected from the group consisting of 6 or more consecutive residues of LYQLVFLLSEAH (SEQ ID No. 26, amino acids 36-47 of IL-4 α receptor); 6 or more consecutive residues of LLMDDVVSAD (SEQ ID No. 27, amino acids 63-72 of IL-4 α receptor); 6 or more consecutive residues of PPDNYLYNH (SEQ ID No. 28, amino acids 123-131 of IL-4 α receptor); and 6 or more consecutive residues of WAQAYNTT (SEQ ID No. 29, amino acids 177-186 of IL-4 α receptor).

19. The method according to claim 12 wherein the composition includes an adjuvant.

20. The method according to claim 19 wherein the adjuvant is selected from the group consisting of: CpG oligodeoxynucleotides, alum, novasomes and liposomes.

21. The method according to claim 12 wherein the carrier protein is a highly immunogenic carrier protein.

22. The method according to claim 21 wherein the carrier protein is selected from the group consisting of hepatitis B core antigen and hepatitis B surface antigen.

23. The method according to claim 22 wherein the peptide is fused into an immunodominant region of the carrier protein.

24. A method of treating, ameliorating or preventing asthma comprising: administering to an individual in need of such a treatment, an effective amount of a composition comprising:

a cytokine-derived peptide or a chemokine-derived peptide or a cytokine-receptor derived peptide or chemokine-receptor derived-peptide;

a carrier protein; and

an adjuvant.

25. The method according to claim 24 wherein the cytokine is selected from the group consisting of IL-4, IL-13, IL-2, IL-3, IL-5, IL-9 or IL-25.

26. The method according to claim 24 wherein the cytokine is IL-4 and the peptide is selected from the group consisting of: 6 or more consecutive residues of DITLQEIIKTLNSLT (SEQ ID No. 1, amino acids 4-18 of IL-4); 6 or more consecutive residues of EKETFCRAATVLRQFYSHH (SEQ ID No. 2, amino acids 41-59 of IL-4); 6 or more consecutive residues of QQFHRHKQLIRFLKRLDRNLWGLA (SEQ ID No. 3, amino acids 71-94 of IL-4); 6 or more consecutive residues of TLENFLERLKTIMREKYS (SEQ ID No. 4, amino acids 108-125 of IL-4); 6 or more consecutive residues of EQKTLCTELTVTDIFA (SEQ ID No. 5, amino acids 19-34 of IL-4); and 6 or more consecutive residues of AGLNSCPVKE (SEQ ID No. 6, amino acids 94-103 of IL-4).

27. The method according to claim 24 wherein the cytokine is IL-13 and the peptide is selected from the group consisting of 6 or more consecutive residues of VPPSTALRELIEELVNITQ (SEQ ID No. 7, amino acids 4-22 of IL-13); 6 or more consecutive residues of MYCAALESLI (SEQ ID No. 8, amino acids 43-

52 of IL-13); 6 or more consecutive residues of VAQFVKDLLLHLKK (SEQ ID No. 9, amino acids 92-105 of IL-13); 6 or more consecutive residues of KDLLLHLKKLFREGRFN (SEQ ID No. 10, amino acids 97-113 of IL-13); 6 or more consecutive residues of KIEVAQFVKDLLLHLKKLFREGRFN (SEQ ID No. 11, amino acids 89-113 of IL-13); 6 or more consecutive residues of SAIEKTQRMLSGFC (SEQ ID No. 12, amino acids 58-71 of IL-13); and 6 or more consecutive residues of NVSGCSAIEKTQRMLSGFC (SEQ ID No. 13, amino acids 53-71 of IL-13).

28. The method according to claim 24 wherein the cytokine is IL-9 and the peptide is selected from the group consisting of 6 or more consecutive residues of PTLAGILDINF (SEQ ID No. 14, amino acids 4-11 of IL-9); 6 or more consecutive residues of TRYPLIFSRVKKSVE (SEQ ID No. 15, amino acids 65-79 of IL-9); 6 or more consecutive residues of NALTFLKSLLEI (SEQ ID No. 16, amino acids 102-113 of IL-9); 6 or more consecutive residues of PASKCHCSANVTSCLCLG (SEQ ID No. 17, amino acids 23-40 of IL-9); 6 or more consecutive residues of CTRPCFSE (SEQ ID No. 18, amino acids 46-53 of IL-9); and 6 or more consecutive residues of KNNKCPYFSCEQPCN (SEQ ID No. 19, amino acids 82-96 of IL-9).

29. The method according to claim 24 wherein the cytokine is IL-5 and the peptide is selected from the group consisting of 6 or more consecutive residues of PTSALVKETLALLSTHRTLLIA (SEQ ID No. 20, amino acids 6-27 of IL-5); 6 or more consecutive residues of PTSALVKETLALLST (SEQ ID No. 21, amino acids 6-20 of IL-5); 6 or more consecutive residues of HRTLLIA (SEQ ID No. 22, amino acids 21-27 of IL-5); 6 or more consecutive residues of EERRRVNQFLD (SEQ ID No. 23, amino acids 88-98 of IL-5); 6 or more consecutive residues of TVERLFKNLSLIKK (SEQ ID No. 24, amino acids 64-77 of IL-5); and PVHKNH (SEQ ID No. 25, amino acids 36-41 of IL-5).

30. The method according to claim 24 wherein the cytokine receptor is IL-4 α receptor and the peptide is selected from the group consisting of 6 or more consecutive residues of LYQLVFLLSEAH (SEQ ID No. 26, amino acids 36-47 of IL-4 α receptor); 6 or more consecutive residues of LLMDDVVSAD (SEQ ID No. 27, amino acids 63-72 of IL-4 α receptor); 6 or more consecutive residues of

PPDNYLYNH (SEQ ID No. 28, amino acids 123-131 of IL-4 α receptor); and 6 or more consecutive residues of WAQAYNTT (SEQ ID No. 29, amino acids 177-186 of IL-4 α receptor).

31. The method according to claim 24 wherein the composition includes an adjuvant.

32. The method according to claim 31 wherein the adjuvant is selected from the group consisting of: CpG oligodeoxynucleotides, alum, novasomes and liposomes.

33. The method according to claim 24 wherein the carrier protein is a highly immunogenic carrier protein.

34. The method according to claim 33 wherein the carrier protein is selected from the group consisting of hepatitis B core antigen and hepatitis B surface antigen.

35. The method according to claim 24 wherein the peptide is fused into an immunodominant region of the carrier protein.

36. An expression system comprising:

a nucleic acid molecule deduced from a peptide selected from the group consisting of: 6 or more consecutive residues of DITLQEIIKTLNSLT (SEQ ID No. 1, amino acids 4-18 of IL-4); 6 or more consecutive residues of EKETFCRAATVLRQFYSHH (SEQ ID No. 2, amino acids 41-59 of IL-4); 6 or more consecutive residues of QQFHRHKQLIRFLKRLDRNLWGLA (SEQ ID No. 3, amino acids 71-94); 6 or more consecutive residues of TLENFLERLKTIMREKYS (SEQ ID No. 4, amino acids 108-125); 6 or more consecutive residues of EQKTLCTELTVTDIFA (SEQ ID No. 5, amino acids 19-34); 6 or more consecutive residues of AGLNSCPVKE (SEQ ID No. 6, amino acids 94-103 of IL-4); 6 or more consecutive residues of VPPSTALRELIEELVNITQ (SEQ ID No. 7, amino acids 4-22 of IL-13); 6 or more consecutive residues of MYCAALESLI (SEQ ID No. 8, amino acids 43-52 of IL-13); 6 or more consecutive residues of VAQFVKDLLLHLKK (SEQ ID No. 9, amino acids 92-105 of IL-13); 6 or more consecutive residues of KDLLLHLKKLFREGRFN (SEQ ID No. 10, amino acids 97-113 of IL-13); 6 or more consecutive residues of KIEVAQFVKDLLLHLKKLFREGRFN (SEQ ID No. 11, amino acids 89-113 of IL-13); 6 or more consecutive residues of SAIEKTQRMLSGFC (SEQ ID No. 12,

amino acids 58-71 of IL-13); 6 or more consecutive residues of NVSGCSAIEKTQRMLSGFC (SEQ ID No. 13, amino acids 53-71 of IL-13); 6 or more consecutive residues of PTLAGILDINF (SEQ ID No. 14, amino acids 4-11 of IL-9); 6 or more consecutive residues of TRYPLIFSRVKKSVE (SEQ ID No. 15, amino acids 65-79 of IL-9); 6 or more consecutive residues of NALTFLKSLLEI (SEQ ID No. 16, amino acids 102-113 of IL-9); 6 or more consecutive residues of PASKCHCSANVTSCLCLG (SEQ ID No. 17, amino acids 23-40 of IL-9); 6 or more consecutive residues of CTRPCFSE (SEQ ID No. 18, amino acids 46-53 of IL-9); 6 or more consecutive residues of KNNKCPYFSCEQPCN (SEQ ID No. 19, amino acids 82-96 of IL-9); 6 or more consecutive residues of PTSALVKETLALLSTHRTLLIA (SEQ ID No. 20, amino acids 6-27 of IL-5); 6 or more consecutive residues of PTSALVKETLALLST (SEQ ID No. 21, amino acids 6-20 of IL-5); 6 or more consecutive residues of HRTLLIA (SEQ ID No. 22, amino acids 21-27 of IL-5); 6 or more consecutive residues of EERRRVNQFLD (SEQ ID No. 23, amino acids 88-98 of IL-5); 6 or more consecutive residues of TVERLFKNLSLIKK (SEQ ID No. 24, amino acids 64-77 of IL-5); PVHKNH (SEQ ID No. 25, amino acids 36-41 of IL-5); 6 or more consecutive residues of LYQLVFLLSEAH (SEQ ID No. 26, amino acids 36-47 of IL-4 α receptor); 6 or more consecutive residues of LLMDDVVSAD (SEQ ID No. 27, amino acids 63-72 of IL-4 α receptor); 6 or more consecutive residues of PPDNYLYNH (SEQ ID No. 28, amino acids 123-131 of IL-4 α receptor); 6 or more consecutive residues of WAQAYNTT (SEQ ID No. 29, amino acids 177-186 of IL-4 α receptor); 6 or more consecutive residues of GPASVPTTCCFNLA (SEQ ID No. 30, amino acids 1-14 of eotaxin); 6 or more consecutive residues of FNLANRKIPLQRLES (SEQ ID No. 31, amino acids 11-25 of eotaxin); 6 or more consecutive residues of RITSGKCPQKAVIFKT (SEQ ID No. 32, amino acids 30-43 of eotaxin); and 6 or more consecutive residues of IFKTKLAKDICAD (SEQ ID No. 33, amino acids 40-52),

genetically fused to a nucleic acid molecule encoding a carrier protein.

37. The expression system according to claim 36 wherein the carrier protein is a highly immunogenic carrier protein.

38. The expression system according to claim 37 wherein the carrier

protein is selected from the group consisting of hepatitis B core antigen and hepatitis B surface antigen.

39. The expression system according to claim 38 wherein the peptide is fused into an immunodominant region of the carrier protein.

40. The reagent according to claim 1 wherein the chemokine is eotaxin and the peptide is selected from the group consisting of 6 or more consecutive residues of GPASVPTTCCFNLA (SEQ ID No. 30, amino acids 1-14 of eotaxin); 6 or more consecutive residues of FNLANRKIPLQRLES (SEQ ID No. 31, amino acids 11-25 of eotaxin); 6 or more consecutive residues of RITSGKCPQKAVIFKT (SEQ ID No. 32, amino acids 30-43 of eotaxin); and 6 or more consecutive residues of IFKTKLAKDICAD (SEQ ID No. 33, amino acids 40-52).

41. The method according to claim 12 wherein the chemokine is eotaxin and the peptide is selected from the group consisting of 6 or more consecutive residues of GPASVPTTCCFNLA (SEQ ID No. 30, amino acids 1-14 of eotaxin); 6 or more consecutive residues of FNLANRKIPLQRLES (SEQ ID No. 31, amino acids 11-25 of eotaxin); 6 or more consecutive residues of RITSGKCPQKAVIFKT (SEQ ID No. 32, amino acids 30-43 of eotaxin); and 6 or more consecutive residues of IFKTKLAKDICAD (SEQ ID No. 33, amino acids 40-52).

42. The method according to claim 24 wherein the chemokine is eotaxin and the peptide is selected from the group consisting of 6 or more consecutive residues of GPASVPTTCCFNLA (SEQ ID No. 30, amino acids 1-14 of eotaxin); 6 or more consecutive residues of FNLANRKIPLQRLES (SEQ ID No. 31, amino acids 11-25 of eotaxin); 6 or more consecutive residues of RITSGKCPQKAVIFKT (SEQ ID No. 32, amino acids 30-43 of eotaxin); and 6 or more consecutive residues of IFKTKLAKDICAD (SEQ ID No. 33, amino acids 40-52).